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SPECIFIC GRAVITY AND BAUMÉ GRAVITY TABLES FOR TURPENTINE

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INTRODUCTION

In wholesale transactions in turpentine, especially at the primary naval stores markets, specific gravity determinations are used in calculating usually in gallons the quantity of lots of turpentine of known weight or in calculating the total weight when the volume is known. They are also used in calculating the weight per gallon. Specific gravity determinations are also used in determining whether samples meet the generally recognized requirements. In this country the gallon (corrected to 60° F.) is used as the unit of measure for turpentine, whereas in most foreign countries turpentine is bought and sold on the basis of weight. In calculating the shipping charges on a lot of turpentine it is often more convenient to determine the weight from the volume than actually to weigh the turpentine shipped.

The specific gravity of a liquid or a solid substance is the ratio of the weight of a definite volume of that substance at a given temperature to the weight of an equal volume of distilled water at the same temperature. Specific gravity may be expressed on the basis of weight in air or weight in vacuum. When expressed on the basis first mentioned it is called apparent specific gravity or simply specific gravity. When expressed on the basis of weight in vacuum, it is known as absolute or true specific gravity.

The ratio of the weight in air of a given volume of a substance at a stated temperature to the weight in air of the equivalent volume of water at some other temperature is frequently but less exactly termed specific gravity.

Specific gravity of a substance may be expressed directly as specific gravity or in terms of one of a number of arbitrary scales, that of Baumé for example. The Baumé scale for liquids lighter than water is based on the following relation to specific gravity:

$$\text{Degrees Baumé} = \frac{140}{\text{specific gravity } 60°/60° \text{ F.}} - 130.$$

Degrees Baumé can be calculated from the above-mentioned formula, and specific gravity can be calculated from Baumé readings by means of the following formula:

$$\text{Specific gravity at } 60°/60° \text{ F.} = \frac{140}{130 + \text{degrees Baumé at } 60° \text{ F.}}$$

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The Baumé gravity of a liquid can be determined directly only with a Baumé hydrometer.

The specific gravity of liquids may be determined in any one of the following three ways:

(1) By weighing a known volume of the liquid at a given temperature and then dividing this weight by the weight of an exactly equal volume of water at the same temperature. When the weighings are made in air and are not corrected to weights *in vacuo*, this method gives results in terms of specific gravity, not in terms of true specific gravity.

(2) By weighing a glass plummet in air at a given temperature, weighing it suspended in water at the same temperature, and finally weighing it suspended in the liquid at the same temperature, and then dividing the loss of weight in the liquid by the loss of weight in the water. The quotient is the specific gravity. Balances are available which are provided with weighed plummets, and the beam and weights of which are graduated to read specific gravity direct.

(3) By means of hydrometers, which are weighted, closed, thin glass tubes, drawn out at one end to a small stem on which are indicated specific gravity or Baumé readings at some standard temperature, usually 60°/60° F. The hydrometer, as customarily made, is the least exact instrument for determining specific gravity, but is the one generally employed in the turpentine trade and gives results that for most practical purposes are sufficiently accurate. Hydrometers are designed to give results in terms of true specific gravity.

NEED FOR DATA ON SPECIFIC AND BAUMÉ GRAVITY OF TURPENTINE

The specific gravity of turpentine is usually determined at the time of filling or emptying shipping containers. The temperature of the turpentine may be very high, 80° to 100° F., or very low, 30° to 0°, depending on the season; and since there is usually no means of controlling the temperature of the sample when making the gravity determination, hydrometer readings are made at the prevailing temperature, and the specific gravity or Baumé at the standard temperature of 60° is calculated from them. As a rule, the specific gravity hydrometer is used for testing turpentine, but some prefer to use the Baumé hydrometer.

To insure the greatest accuracy and the closest agreement between the results obtained by the buyer and those obtained by the seller, the actual determination of specific gravity or Baumé should be made at the temperature for which the hydrometer is calibrated, generally 60° F. Hydrometer readings at any other temperature are inaccurate and must be corrected.

United States Department of Agriculture Bulletin 898 [1] contains a table for converting the observed specific gravities of turpentine at temperatures from 50° to 75° F. (in 1-degree intervals) to specific gravity at 60°. The observed gravities range from 0.8600 to 0.8800 at 60° in 0.0010 intervals. There is, however, a need for tables for specific gravity or Baumé gravity of turpentine better suited for the conditions under which the gravity of turpentine is usually determined in commercial transactions.

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[1] VEITCH, F. P., and GROTLISCH, V. E. TURPENTINE: ITS SOURCES, PROPERTIES, USES, TRANSPORTATION, AND MARKETING, WITH RECOMMENDED SPECIFICATIONS. U. S. Dept. Agr. Bul. 898, 51 p., illus. 1920. (Revised, 1921.)

Rather than extend existing tables, it was deemed advisable to determine the gravity (specific and Baumé) of turpentine from 32° to 96° F. by actual tests with hydrometers standardized for making these determinations at 60°, which are the hydrometers used in the trade. Sixteen authentic samples of turpentine, including two steam distilled wood turpentines and two all slash gum turpentines were tested. At 15.5° C. the specific gravities of these samples ranged from 0.8617 to 0.8756, thus covering as nearly as practicable the generally accepted range of 0.8600 to 0.8750.

HOW THE TESTS WERE MADE

The tests on the individual turpentines were carried out as follows: A large glass cylinder was filled to about two-thirds its capacity with the sample and closed with a wooden cover sealed with shellac. Standardized Baumé and specific-gravity hydrometers calibrated at 60° F. were introduced through a circular hole in the cover and carefully floated in the sample. To avoid oxidation, the air in the cylinder was displaced by carbon dioxide introduced through a glass tube on one side of the cover. When all the air was displaced, the hole in the cover was tightly closed with a cork stopper carrying a thermometer of the Anschutz type (sensitive to 0.02° C.), the bulb of which reached the center of the cylinder. The glass tube was left connected with a carbon dioxide reservoir to allow for contraction and expansion within the cylinder.

The cylinder was then placed in a large constant-temperature water bath and allowed to remain (the turpentine being occasionally agitated by gentle swirling of the cylinder), until the temperature of the turpentine was the same as that of the bath. The cylinder was then raised in the bath until the level of the turpentine was slightly higher than that of the water in the bath, and the hydrometers were read with the aid of a mirror. The readings, together with the temperatures, were recorded. The temperature of the bath was then changed, and the process repeated. Usually the sample was placed in the bath at 35° F. and the temperature raised by 9-degree steps to 95°, but in some cases the temperature was changed irregularly to determine whether there was any appreciable lag in the expansion or contraction of the hydrometer. Several tests of alternately raising and lowering the temperature of the turpentine showed that the hydrometers were sensitive to temperature changes and that such changes caused no error.

The corrected readings obtained on each sample were plotted for temperature and gravity, and the resulting curves were found to be in close agreement. In aligning the curves it was necessary to make only a few corrections in the observed readings of ±0.0001 for specific gravity and ±0.01° for Baumé gravity. Tables 1 and 2 were prepared from these corrected curves. From these tables graphs may be prepared on cross-section millimeter paper showing the temperature in intervals of 0.1° C. or 0.2° F. and the gravity in intervals of 0.0001 specific or 0.01° Baumé by plotting the specific gravity curves from 0.8600 to 0.8750 in intervals of 0.001 at 60° F. or 15.5° C. and the Baumé gravity curves from 30.00° to 32.80° in intervals of 0.1° at 60° F. or 15.5° C. In the use of these graphs it will be necessary to make interpolations only for gravity, as the temperature intervals are so small as to need no interpolations.

TABLE 1.—*Specific gravity of turpentine from 32° to 95° F.*

[To obtain the true specific gravity of turpentine at the standard temperature of 60° F. from observed readings taken at other temperatures on a specific-gravity hydrometer standardized for 60° F., locate observed reading, by interpolation if necessary, in horizontal line opposite temperature at which reading was made, follow in vertical column to corresponding reading at 60°, which is the true specific gravity at 60°.]

Temperature at which reading is made (°F.)	Specific gravity															
32	0.8722	0.8732	0.8742	0.8751	0.8761	0.8770	0.8780	0.8790	0.8800							
33	.8718	.8728	.8738	.8747	.8757	.8766	.8776	.8786	.8796							
34	.8713	.8723	.8733	.8742	.8752	.8761	.8771	.8781	.8791	0.8801						
35	.8709	.8719	.8729	.8738	.8748	.8757	.8767	.8777	.8787	.8797						
36	.8704	.8714	.8724	.8733	.8743	.8752	.8762	.8772	.8782	.8792	0.8801					
37	.8700	.8710	.8720	.8729	.8739	.8748	.8758	.8768	.8778	.8788	.8797					
38	.8695	.8705	.8715	.8725	.8735	.8744	.8754	.8764	.8774	.8784	.8793					
39	.8691	.8701	.8711	.8720	.8730	.8739	.8749	.8759	.8769	.8779	.8789	0.8799				
40	.8686	.8696	.8706	.8716	.8726	.8735	.8745	.8755	.8765	.8775	.8784	.8794				
41	.8682	.8692	.8702	.8712	.8722	.8731	.8741	.8751	.8761	.8771	.8780	.8790	0.8800			
42	.8677	.8687	.8697	.8707	.8717	.8727	.8737	.8747	.8757	.8767	.8776	.8786	.8796			
43	.8673	.8683	.8693	.8703	.8713	.8723	.8733	.8743	.8753	.8763	.8772	.8782	.8792	0.8802		
44	.8669	.8679	.8689	.8699	.8709	.8718	.8728	.8738	.8748	.8758	.8768	.8778	.8788	.8798		
45	.8664	.8674	.8684	.8694	.8704	.8714	.8724	.8734	.8744	.8754	.8764	.8774	.8784	.8794		
46	.8660	.8670	.8680	.8690	.8700	.8710	.8720	.8730	.8740	.8750	.8759	.8769	.8779	.8789	0.8799	
47	.8656	.8666	.8676	.8686	.8696	.8705	.8716	.8726	.8736	.8746	.8755	.8765	.8775	.8785	.8795	
48	.8651	.8661	.8671	.8681	.8691	.8701	.8711	.8721	.8731	.8741	.8751	.8761	.8771	.8781	.8791	0.8801
49	.8647	.8657	.8667	.8677	.8687	.8697	.8707	.8717	.8727	.8737	.8747	.8757	.8767	.8777	.8787	.8797
50	.8643	.8653	.7663	.8673	.8683	.8693	.8703	.8712	.8722	.8732	.8742	.8752	.8762	.8772	.8782	.8792
51	.8639	.8649	.8659	.8669	.8679	.8689	.8699	.8708	.8718	.8728	.8738	.8748	.8758	.8768	.8778	.8788
52	.8634	.8644	.8654	.8664	.8674	.8684	.8694	.8704	.8714	.8724	.8734	.8744	.8754	.8764	.8774	.8784
53	.8630	.8640	.8650	.8660	.8670	.8680	.8690	.8699	.8709	.8719	.8729	.8739	.8749	.8759	.8769	.8779
54	.8626	.8636	.8645	.8656	.8666	.8676	.8686	.8695	.8705	.8715	.8725	.8735	.8745	.8755	.8765	.8775
55	.8621	.8631	.8641	.8651	.8661	.8671	.8681	.8691	.8701	.8711	.8721	.8731	.8741	.8751	.8761	.8771
56	.8617	.8627	.8637	.8647	.8657	.8667	.8677	.8687	.8697	.8707	.8717	.8727	.8737	.8747	.8757	.8767
57	.8613	.8623	.8633	.8643	.8653	.8663	.8673	.8683	.8693	.8703	.8713	.8723	.8733	.8743	.8753	.8763
58	.8608	.8618	.8628	.8638	.8648	.8658	.8668	.8678	.8688	.8698	.8708	.8718	.8728	.8738	.8748	.8758
59	.8604	.8614	.8624	.8634	.8644	.8654	.8664	.8674	.8684	.8694	.8704	.8714	.8724	.8734	.8744	.8754
60	.8600	.8610	.8620	.8630	.8640	.8650	.8660	.8670	.8680	.8690	.8700	.8710	.8720	.8730	.8740	.8750
61	.8595	.8605	.8615	.8625	.8635	.8645	.8655	.8665	.8675	.8685	.8695	.8705	.8715	.8725	.8735	.8745
62	.8591	.8601	.8611	.8621	.8631	.8641	.8651	.8661	.8671	.8681	.8691	.8701	.8711	.8721	.8731	.8741
63	.8586	.8596	.8606	.8616	.8626	.8636	.8646	.8656	.8666	.8676	.8686	.8696	.8706	.8716	.8726	.8736
64	.8582	.8592	.8602	.8612	.8622	.8632	.8642	.8652	.8662	.8672	.8682	.8692	.8702	.8712	.8722	.8732
65	.8577	.8587	.8597	.8607	.8617	.8627	.8637	.8647	.8657	.8667	.8677	.8687	.8697	.8707	.8717	.8727

66	.8573	.8583	.8593	.8603	.8613	.8623	.8633	.8643	.8653	.8663	.8673	.8683	.8693	.8703	.8713	.8723
67	.8568	.8578	.8588	.8598	.8608	.8618	.8628	.8638	.8648	.8658	.8668	.8678	.8688	.8698	.8708	.8718
68	.8564	.8574	.8584	.8594	.8604	.8614	.8624	.8634	.8644	.8654	.8664	.8674	.8684	.8694	.8704	.8714
69	.8559	.8569	.8579	.8589	.8599	.8609	.8620	.8630	.8640	.8650	.8660	.8670	.8680	.8690	.8700	.8710
70	.8555	.8565	.8575	.8585	.8595	.8605	.8615	.8625	.8635	.8645	.8655	.8665	.8675	.8685	.8695	.8705
71	.8550	.8560	.8570	.8580	.8590	.8600	.8611	.8621	.8631	.8641	.8651	.8661	.8671	.8681	.8691	.8701
72	.8545	.8556	.8566	.8576	.8586	.8596	.8606	.8616	.8626	.8636	.8646	.8656	.8666	.8676	.8686	.8696
73	.8541	.8551	.8561	.8571	.8581	.8591	.8601	.8611	.8621	.8631	.8641	.8652	.8662	.8672	.8682	.8692
74	.8537	.8547	.8557	.8567	.8577	.8587	.8597	.8607	.8617	.8627	.8637	.8647	.8657	.8667	.8677	.8687
75	.8532	.8542	.8552	.8562	.8572	.8582	.8593	.8603	.8613	.8623	.8633	.8643	.8653	.8663	.8673	.8683
76	.8528	.8538	.8548	.8558	.8568	.8578	.8588	.8598	.8608	.8618	.8628	.8638	.8648	.8658	.8668	.8678
77	.8523	.8533	.8543	.8553	.8563	.8573	.8584	.8594	.8604	.8614	.8624	.8634	.8644	.8654	.8664	.8674
78	.8518	.8528	.8538	.8548	.8558	.8568	.8579	.8589	.8599	.8609	.8620	.8630	.8640	.8650	.8660	.8670
79	.8514	.8524	.8534	.8544	.8554	.8564	.8575	.8585	.8595	.8605	.8615	.8625	.8635	.8645	.8655	.8665
80	.8509	.8519	.8529	.8539	.8549	.8559	.8570	.8580	.8590	.8600	.8611	.8621	.8631	.8641	.8651	.8661
81	.8505	.8515	.8525	.8535	.8545	.8555	.8566	.8576	.8586	.8596	.8606	.8616	.8626	.8636	.8646	.8656
82	.8500	.8510	.8520	.8530	.8540	.8550	.8561	.8571	.8581	.8591	.8601	.8611	.8622	.8632	.8642	.8652
83	.8496	.8506	.8516	.8526	.8536	.8546	.8557	.8567	.8577	.8587	.8597	.8607	.8617	.8627	.8637	.8647
84	.8491	.8501	.8511	.8521	.8531	.8541	.8552	.8562	.8572	.8582	.8593	.8603	.8613	.8623	.8633	.8643
85	.8486	.8496	.8507	.8517	.8527	.8537	.8548	.8558	.8568	.8578	.8588	.8598	.8608	.8618	.8628	.8638
86	.8481	.8491	.8502	.8512	.8522	.8532	.8543	.8553	.8563	.8573	.8584	.8594	.8604	.8614	.8624	.8634
87	.8476	.8486	.8497	.8507	.8517	.8527	.8538	.8548	.8558	.8568	.8579	.8589	.8599	.8609	.8619	.8629
88	.8472	.8482	.8493	.8503	.8513	.8523	.8534	.8544	.8554	.8564	.8575	.8585	.8595	.8605	.8615	.8625
89	.8467	.8477	.8488	.8498	.8508	.8518	.8529	.8539	.8549	.8559	.8570	.8580	.8590	.8600	.8610	.8620
90	.8463	.8473	.8484	.8494	.8504	.8514	.8525	.8535	.8545	.8555	.8566	.8576	.8586	.8596	.8606	.8616
91	.8458	.8468	.8479	.8489	.8499	.8509	.8520	.8530	.8540	.8550	.8561	.8571	.8581	.8591	.8601	.8611
92	.8454	.8464	.8475	.8485	.8495	.8505	.8516	.8526	.8536	.8546	.8557	.8567	.8577	.8587	.8597	.8607
93	.8449	.8459	.8470	.8480	.8490	.8500	.8511	.8521	.8531	.8541	.8552	.8562	.8572	.8582	.8592	.8602
94	.8445	.8455	.8466	.8476	.8486	.8496	.8507	.8517	.8527	.8537	.8548	.8558	.8568	.8578	.8588	.8598
95	.8440	.8450	.8461	.8471	.8481	.8491	.8502	.8512	.8522	.8532	.8543	.8553	.8563	.8573	.8583	.8593

TABLE 2.—*Baumé gravity of turpentine from 32° to 95° F.*

[To obtain the true Baumé gravity of turpentine at the standard temperature of 60° F. from observed readings taken at other temperatures on a Baumé hydrometer standardized for 60° (modulus 140), locate observed reading, by interpolation if necessary, in horizontal line opposite temperature at which reading was made, follow in vertical column to corresponding reading at 60°, which is the true Baumé at 60°]

Temperature at which Baumé reading is made (°F.)	Baumé gravity														
32	30.52	30.33	30.14	29.95	29.76	29.57	29.38	29.19	29.00						
33	30.60	30.41	30.22	30.03	29.84	29.65	29.46	29.27	29.08						
34	30.68	30.49	30.30	30.11	29.92	29.73	29.54	29.35	29.16	28.97					
35	30.77	30.58	30.39	30.19	30.00	29.81	29.62	29.43	29.24	29.05					
36	30.85	30.66	30.47	30.27	30.08	29.89	29.70	29.51	29.32	29.13					
37	30.93	30.74	30.55	30.35	30.16	29.97	29.78	29.59	29.40	29.21	29.02				
38	31.01	30.82	30.63	30.44	30.24	30.05	29.86	29.67	29.48	29.29	29.10				
39	31.10	30.90	30.71	30.52	30.33	30.14	29.94	29.75	29.56	29.36	29.17				
40	31.18	30.99	30.79	30.60	30.41	30.22	30.02	29.83	29.64	29.44	29.25	29.06			
41	31.26	31.07	30.88	30.68	30.49	30.30	30.10	29.91	29.72	29.52	29.33	29.14			
42	31.34	31.15	30.96	30.76	30.57	30.38	30.18	29.99	29.80	29.60	29.41	29.21	29.01		
43	31.43	31.23	31.04	30.84	30.65	30.46	30.26	30.07	29.88	29.68	29.48	29.29	29.09		
44	31.51	31.32	31.12	30.92	30.73	30.54	30.34	30.15	29.95	29.75	29.56	29.37	29.17		
45	31.59	31.40	31.20	31.00	30.81	30.61	30.42	30.23	30.03	29.83	29.64	29.45	29.26	29.05	
46	31.67	31.48	31.28	31.08	30.89	30.69	30.50	30.30	30.11	29.91	29.71	29.52	29.32	29.12	
47	31.75	31.56	31.36	31.16	30.96	30.77	30.57	30.38	30.19	29.99	29.79	29.60	29.40	29.20	29.01
48	31.83	31.64	31.44	31.24	31.04	30.85	30.65	30.46	30.27	30.07	29.87	29.68	29.48	29.28	29.08
49	31.91	31.72	31.52	31.32	31.12	30.93	30.73	30.54	30.34	30.14	29.95	29.75	29.55	29.35	29.16
50	31.99	31.80	31.60	31.40	31.20	31.01	30.81	30.62	30.42	30.22	30.02	29.83	29.63	29.43	29.24
51	32.07	31.88	31.68	31.48	31.28	31.09	30.89	30.70	30.50	30.30	30.10	29.91	29.71	29.51	29.31
52	32.15	31.96	31.76	31.56	31.36	31.17	30.97	30.77	30.58	30.38	30.18	29.98	29.78	29.58	29.39
53	32.24	32.04	31.84	31.64	31.44	31.25	31.05	30.85	30.66	30.46	30.26	30.06	29.86	29.66	29.47
54	32.32	32.12	31.92	31.72	31.52	31.33	31.13	30.93	30.73	30.53	30.33	30.14	29.94	29.74	29.54
55	32.40	32.20	32.00	31.80	31.60	31.40	31.21	31.01	30.81	30.61	30.41	30.21	30.02	29.82	29.62
56	32.48	32.28	32.08	31.88	31.68	31.48	31.29	31.09	30.89	30.69	30.49	30.29	30.09	29.89	29.70
57	32.56	32.36	32.16	31.96	31.76	31.56	31.36	31.17	30.97	30.77	30.57	30.37	30.17	29.97	29.77
58	32.64	32.44	32.24	32.04	31.84	31.64	31.44	31.24	31.04	30.84	30.64	30.44	30.24	30.04	29.85
59	32.72	32.52	32.32	32.12	31.92	31.72	31.52	31.32	31.12	30.92	30.72	30.52	30.32	30.12	29.92
60	32.80	32.60	32.40	32.20	32.00	31.80	31.60	31.40	31.20	31.00	30.80	30.60	30.40	30.20	30.00
61	32.89	32.69	32.49	32.29	32.09	31.89	31.68	31.48	31.28	31.08	30.88	30.68	30.48	30.28	30.08
62	32.97	32.77	32.57	32.37	32.17	31.97	31.77	31.57	31.37	31.17	30.97	30.77	30.57	30.37	30.17
63	33.06	32.86	32.66	32.46	32.26	32.06	31.85	31.65	31.45	31.25	31.05	30.85	30.65	30.45	30.25
64	33.14	32.94	32.74	32.54	32.34	32.14	31.94	31.74	31.53	31.33	31.13	30.93	30.73	30.53	30.33
65	33.23	33.03	32.83	32.63	32.43	32.23	32.02	31.82	31.62	31.42	31.22	31.02	30.82	30.62	30.42

66	33.31	33.11	32.91	32.71	32.51	32.31	32.11	31.91	31.70	31.50	31.30	31.10	30.90	30.70	30.50
67	33.40	33.20	33.00	32.80	32.60	32.40	32.19	31.99	31.79	31.59	31.39	31.19	30.98	30.78	30.58
68	33.48	33.28	33.08	32.88	32.68	32.48	32.27	32.07	31.87	31.67	31.47	31.27	31.06	30.86	30.66
69	33.57	33.37	33.17	32.97	32.76	32.56	32.36	32.16	31.96	31.75	31.55	31.35	31.15	30.95	30.74
70	33.66	33.46	33.26	33.05	32.85	32.65	32.44	32.24	32.04	31.84	31.64	31.43	31.23	31.03	30.83
71	33.75	33.54	33.34	33.14	32.94	32.73	32.53	32.33	32.12	31.92	31.72	31.52	31.31	31.11	30.91
72	33.84	33.63	33.43	33.23	33.02	32.82	32.62	32.41	32.21	32.01	31.80	31.60	31.40	31.19	30.99
73	33.92	33.72	33.52	33.31	33.11	32.90	32.70	32.50	32.29	32.09	31.89	31.68	31.48	31.27	31.07
74	34.01	33.80	33.60	33.40	33.19	32.99	32.79	32.58	32.38	32.17	31.97	31.77	31.56	31.36	31.16
75	34.10	33.89	33.69	33.48	33.28	33.08	32.87	32.67	32.46	32.26	32.06	31.85	31.65	31.44	31.24
76	34.19	33.98	33.78	33.57	33.37	33.16	32.96	32.75	32.55	32.34	32.14	31.93	31.73	31.53	31.32
77	34.27	34.07	33.86	33.66	33.45	33.25	33.04	32.84	32.63	32.43	32.22	32.02	31.81	31.61	31.40
78	34.36	34.16	33.95	33.75	33.54	33.34	33.13	32.92	32.72	32.51	32.31	32.10	31.90	31.69	31.49
79	34.45	34.25	34.04	33.83	33.63	33.42	33.22	33.01	32.81	32.60	32.39	32.19	31.98	31.77	31.57
80	34.54	34.34	34.13	33.92	33.72	33.51	33.30	33.10	32.89	32.69	32.48	32.27	32.06	31.86	31.65
81	34.63	34.43	34.22	34.01	33.81	33.60	33.39	33.18	32.98	32.77	32.56	32.36	32.15	31.94	31.73
82	34.72	34.52	34.31	34.10	33.89	33.69	33.47	33.27	33.06	32.85	32.65	32.44	32.23	32.02	31.81
83	34.81	34.61	34.40	34.19	33.98	33.77	33.56	33.36	33.15	32.94	32.73	32.53	32.32	32.11	31.90
84	34.90	34.70	34.49	34.28	34.07	33.86	33.65	33.44	33.24	33.03	32.82	32.61	32.40	32.19	31.98
85	34.99	34.79	34.58	34.37	34.16	33.95	33.74	33.53	33.32	33.11	32.90	32.70	32.49	32.28	32.07
86	35.08	34.87	34.66	34.45	34.25	34.04	33.83	33.62	33.41	33.20	32.99	32.78	32.57	32.36	32.15
87	35.17	34.96	34.75	34.54	34.33	34.12	33.91	33.70	33.49	33.28	33.07	32.86	32.65	32.44	32.23
88	35.26	35.05	34.84	34.63	34.42	34.21	34.00	33.79	33.58	33.37	33.16	32.95	32.74	32.53	32.32
89	35.34	35.13	34.93	34.72	34.51	34.30	34.09	33.88	33.67	33.46	33.25	33.04	32.82	32.61	32.40
90	35.43	35.22	35.01	34.80	34.59	34.38	34.17	33.96	33.75	33.54	33.33	33.12	32.91	32.70	32.49
91	35.52	35.31	35.10	34.89	34.68	34.47	34.26	34.05	33.84	33.63	33.42	33.21	33.00	32.79	32.58
92	35.60	35.40	35.19	34.98	34.77	34.55	34.34	34.13	33.92	33.71	33.50	33.29	33.08	32.87	32.66
93	35.69	35.48	35.27	35.06	34.85	34.64	34.43	34.22	34.01	33.80	33.59	33.38	33.17	32.96	32.75
94	35.78	35.57	35.36	35.15	34.94	34.73	34.52	34.31	34.10	33.88	33.67	33.46	33.25	33.04	32.83
95	35.87	35.66	35.45	35.24	35.02	34.81	34.60	34.39	34.18	33.97	33.76	33.55	33.34	33.13	32.91

HOW TO DETERMINE THE GRAVITY OF TURPENTINE

In determining the gravity of turpentine, the sample must, of course, be representative of the turpentine to be tested. The value of the test will then depend upon the accuracy of the instruments and the care with which they are used.

EQUIPMENT

The following equipment is needed in determining the gravity of turpentine.

SPECIFIC-GRAVITY HYDROMETER

A specific-gravity hydrometer, calibrated at 60°/60° F.; range, 0.8400 to 0.8800; subdivided in 0.0005 and guaranteed accurate to ±0.0005, or a Baumé hydrometer, for liquids lighter than water (modulus 140), calibrated at 60° F.; range, 29°–36°; subdivided in 0.1° Baumé, and guaranteed accurate to ±0.1°. All hydrometers should be guaranteed accurate or standardized by the Bureau of Standards, United States Department of Commerce.

THERMOMETER

Thermometer, Fahrenheit scale graduated in 1° (or preferably 0.5°), ranging from 30° to 100° F., guaranteed accurate to 0.5°, or standardized by the Bureau of Standards.

HYDROMETER JAR

A clear glass jar or cylinder having a height equal to the length of the hydrometer and an inside diameter at least 1 inch greater than the diameter of the hydrometer bulb.

PROCEDURE

Fill the hydrometer jar to within about 2 inches of the top with the turpentine to be tested; place the thermometer in the jar, and set it on a table in a sheltered place. Carefully immerse the hydrometer in the turpentine to a point slightly below that to which it naturally sinks and then allow it to float freely. Be sure the hydrometer is not in contact with the jar or the thermometer. When the temperature as registered by the thermometer has become stationary and the turpentine and the hydrometer are free from air bubbles and are at rest, place the eye slightly below the plane of the surface of the turpentine and raise the eye slowly until this plane appears to be a line. Take the reading of the instrument at the point at which this line cuts the hydrometer scale. The fourth decimal on the specific-gravity scale and the second decimal on the Baumé scale must be determined by interpolating (estimating) from the smallest division on the scale. Record the reading of the hydrometer and the thermometer (first making corrections if instruments have been standardized). If the temperature of the turpentine is 60° F., the readings are in terms of specific gravity or Baumé, depending on the kind of hydrometer used. If the temperature of the turpentine is not 60°, the gravity of the turpentine at the standard temperature of 60° may be obtained from Tables 1 or 2.

On removing the hydrometer from the turpentine, carefully wipe it dry with a clean cloth and replace it in its container.

After the gravity of a turpentine at 60° F. has been determined, its volume may be calculated from its known weight, or its weight may be calculated from its known volume by using Table 3.

TABLE 3.—*Corresponding specific gravity and Baumé. Pounds per gallon and gallon per pound of spirits of turpentine* [1]

Specific gravity 60°/60° F.	Degrees Baumé (modulus 140)	Pounds per gallon	Gallon per pound	Specific gravity 60°/60° F.	Degrees Baumé (modulus 140)	Pounds per gallon	Gallon per pound
0.8750	30.0	7.286	0.1372	0.8663	31.6	7.214	0.1386
.8745	30.1	7.282	.1373	.8658	31.7	7.210	.1387
.8739	30.2	7.277	.1374	.8653	31.8	7.205	.1388
.8734	30.3	7.273	.1375	.8647	31.9	7.201	.1389
.8728	30.4	7.268	.1376	.8642	32.0	7.196	.1390
.8723	30.5	7.264	.1377	.8637	32.1	7.192	.1390
.8717	30.6	7.259	.1378	.8631	32.2	7.187	.1391
.8712	30.7	7.254	.1379	.8626	32.3	7.183	.1392
.8706	30.8	7.249	.1379	.8621	32.4	7.178	.1393
.8701	30.9	7.245	.1380	.8615	32.5	7.173	.1394
.8696	31.0	7.241	.1381	.8610	32.6	7.169	.1395
.8690	31.1	7.236	.1382	.8605	32.7	7.165	.1396
.8685	31.2	7.232	.1383	.8600	32.8	7.161	.1396
.8679	31.3	7.227	.1384	.8594	32.9	7.156	.1397
.8674	31.4	7.223	.1385	.8589	33.0	7.152	.1398
.8669	31.5	7.218	.1385				

[1] Rearranged from the following publication: BEARCE, H. W. DENSITY AND THERMAL EXPANSION OF LINSEED OIL AND TURPENTINE (INCLUDING CONVERSION TABLES OF POUNDS TO GALLONS AND GALLONS TO POUNDS). U. S. Dept. Com., Bur. Standards Tech. Paper 9, 27 p. 1912.

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